MIT BE

BIOLOGICAL ENGINEERING

GRADUATE STUDENT HANDBOOK

2017-2018

Massachusetts Institute of Technology
Cambridge, MA 02139

Preface

The purpose of this manual is to assemble information in one location for the convenience of graduate students in the Department of Biological Engineering (Course XX) and their supervisors. This document is not comprehensive, nor does the information contained herein supersede or have priority over that contained in the MIT Bulletin or the Graduate Education Manual. The BE Graduate Program Committee also reserves the right of further interpretation and modification of the information herein on an ongoing basis.

This manual is a dynamic document, which will be updated periodically. Graduate students and supervisors are therefore encouraged to obtain the most recent manual. Suggested additions or corrections are welcomed and should be addressed to the Graduate Program Committee in Room 16-267.

MIT Graduate Student Manual: http://web.mit.edu/gso/gpp/index.html
MIT Bulletin: http://web.mit.edu/catalog/index.html
MIT Academic Calendar: http://web.mit.edu/registrar/calendar/index.html
Student Resources: http://resources.mit.edu

Other Sources of Information and support for graduate students:

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Academic policy for graduate students is the responsibility of the Graduate Program Committee; students should feel free to consult with its members at any time.

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I. DOCTORAL DEGREE PROGRAM

The mission of Biological Engineering (BE) is to educate leaders, and to generate and communicate new knowledge at the interface of engineering with biology. Our focus at this interface is on combining quantitative, physical, and integrative principles with advances in modern biology.

Graduate level training in BE prepares students to do research that will:

- Increase understanding of how biological systems function in terms of physical/chemical mechanisms, and of how they respond when perturbed by external factors including medical therapeutics and environmental agents.
- Create novel technologies based on this understanding for a spectrum of applications emphasizing, but not limited to, human health from both medical and environmental perspectives.
- Generate new biology-based paradigms for solving problems in non-biological applications of science and engineering.

The primary graduate degree offered by the department is a Biological Engineering Ph.D.

II. ADMISSIONS

MIT's Department of Biological Engineering offers a graduate PhD degree program. MIT admits students for the fall term each year; there is no January or June admission.

Applicants are encouraged to submit their applications as early as possible and are responsible for ensuring that all admissions credentials are submitted on time. Your application will not be reviewed until all materials have been received. There is no separate application for financial support; all admitted students are offered support. To apply follow these steps:

1. Fill out the online application by 23:59, EST, December 15. You will be providing the following information:

- Field(s) of interest
- Personal information/addresses
- International student data
- **Three or more names and email addresses of letter writers**
- Scanned copies of your **College Transcripts**
- Scanned copies of your **GRE Scores**
- For international students, scanned copies of your **IELTS scores**
- Educational and work history
- Statement of objectives
- Outside financial support and potential outside support
- Credit card payment of $75

2. Arrange for submission of the following (official reports only):
Scanned PDF transcripts and GRE, and IELTS scores are considered unofficial documents but are sufficient for review purposes. Official documents are required before an admissions decision can be made. Please have your test scores electronically transmitted to MIT Admissions and mail official copies of your transcript(s) to:

MIT Department of Biological Engineering
77 Massachusetts Avenue, Bldg. 16-267
Cambridge, MA 02139

GRE general scores: Electronic submission - MIT's school code for the GRE is 3514. The code for the Department of Biological Engineering at MIT is 1603.

For international students, **IELTS**: scores should also be electronically sent directly to MIT.

- To register for a test, visit http://www.ielts.org
- IELTS does not require a code. Please write "Department of Biological Engineering, Massachusetts Institute of Technology". No address is required as scores are reported electronically.
- If you are an international student, you should take the IELTS test by November 15. The Department of Biological Engineering does not waive this requirement.

Frequently asked admissions related questions can be found on our website.

III. FINANCIAL AID

Students may find financial support for their studies in the Department either from personal sources, outside fellowship programs (such as government fellowships, sponsorship by a private company or from abroad for international students). The Department strives to offer financial support in the form of departmental fellowships for the fall term of the first academic year to all regular first year doctoral graduate students. Support for spring term of the first year and succeeding years thereafter is generally available in the form of a research assistantship from the student's research advisor(s).

Research Assistants

Research assistants (RAs) are supported from research contracts or grants, and are supervised by faculty members of the Department. In this case, the research advisor(s) has a responsibility to the funding organization to conduct research in specified areas. In most cases, an appointment as a research assistant (RA) coincides with the selection of a research topic and a research advisor(s). That is, the student declares that his/her thesis will be conducted in the area specified in the research project's grant (contract).

In the case of research assistants (RAs), an arrangement is made with the research advisor(s) to provide project funds for tuition and stipend. The research advisor(s) will notify the BE Student Office each semester about the funding source, so that appointments can be processed. Research Assistants (RA) and Teaching Assistants (TA) are paid ONCE PER MONTH on the last day of the month. Taxes are automatically withheld from each paycheck.

A research assistant is an employee of the Institute and is required to devote full time to the research project, at the very minimum during normal working hours, with the exception of the time spent in scheduled lecture or laboratory classes for which the student is registered. Specific details concerning work hours and duties and the scheduling of vacations should be arranged with the faculty supervisor. A research assistant is allowed two weeks of vacation per calendar year (excluding Institute holidays). Additional vacation time is allowed only with the permission of the research advisor(s).

Teaching Assistants

BE Department requires its graduate students enrolled in the Ph.D. program to serve as a teaching assistant for one semester after completing the first year and successfully passing the written qualifying exams. Students serve as teaching assistants for one semester and receive 12 units of academic credit.

Teaching Assistants (TAs) play a central role in the Department's educational program. Service as a Teaching Assistant, working closely with one or more faculty members in the Department, is an important and beneficial aspect of the graduate school experience. Each TA is assigned to a specific undergraduate or graduate subject. While the exact duties of the TA vary depending on the subject and the teaching methodology of the subject instructor(s), typically, the TA duties involve:

- Developing and grading problem assignments.
- Grading reports and examinations.
- Holding regular office hours for individual students and group-help sessions.
- Leading recitation sections and tutorials.
- Planning, designing, and supervising laboratory experiments.

- Proctoring examinations.
- Preparing a subject solution book.

TA assignments are generally made at least one month before the beginning of the academic year. In some cases, enrollment-driven last-minute TA assignments or changes are necessary. All BE doctoral graduate students are required to serve as a TA for one semester by the time of the presentation of their Thesis Proposal (2nd Year). Students are asked to submit their subject choices to TA by summer of the first year. The Department then makes final assignments of TA's based on course offerings and enrollments for the academic year.

It is the responsibility of the student to coordinate the selection of which semesters are best to TA with his/her research advisor(s) with the understanding that the student will not be paid as TA by the Department but will be supported by his/her research advisor funds. The early identification of possible periods of TA duty allows for effective planning by students and research advisors of activities related to the thesis project. Upon assignment of a teaching assistantship, it is the responsibility of the TA to contact the subject instructor(s) and request of detailed responsibilities including time commitment etc.

Students must register for 20.960 (Teaching Experience) for 12 units during the semester for which they were assigned to TA.

Fellowships

Fellowship funds come from two general sources — outside or inside the Institute. Examples of outside fellowships include: NSF, Hertz, DOD, NIH Fellowships.

Fellowships from MIT funds are typically limited to first-year graduate students. Funds for such awards are usually provided by gifts from alumni, unrestricted grants from industry, or from the Provost's Office in the form of Presidential Fellowships.

Graduate students who are supported with a Departmental Fellowship have no limitations with regard to credit units that they may take. As a guideline, however, a full course load is considered to be 48 credit units each semester. The recipient of a Departmental Fellowship is under no obligation, either real or implied, to the donor of the fellowship, other than to carry out his/her program of studying and research in a diligent manner.

Recipients of outside fellowships (NSF, DOD, Hertz etc.) should check with the coordinating official in the BE Academic Office (room 16-267), to determine any existing obligations regarding their fellowships.

Fellowship, Scholarship, and Training Grant recipients are paid are paid ONCE PER MONTH on the last day of the month. Although this funding may be taxable, taxes are NOT automatically withheld from these payments. You may need to arrange to make estimated quarterly payments on your own.

The recipient of a fellowship is allowed two weeks of vacation per calendar year (excluding Institute holidays). Additional vacation time is allowed only with the permission of the research advisor(s).

Please see Appendix for a list of Non-MIT Fellowships.

Other sources of Financial Aid

Graduate Graders

A Graduate Grader position may be open in certain semesters to ease the burden on TAs in high enrollment undergraduate and core graduate subjects. These grader positions are advertised to the graduate student body at the beginning of each term. Students volunteer for these positions, and must be serving as a full-time RA or Fellow during the term of service as a grader. Graduate Graders are involved in grading homework assignments, copying material for class, and preparing project materials. Graduate Graders should not be responsible for any activity involving student contact. Graduate Graders are paid $15/hour for their services, and can work no more than 10 hours per week. These positions are open solely to citizens of the United States.

Graduate Resident Tutors

Resident graduate students who have completed at least one graduate year at MIT or new students who were MIT undergraduates may apply to the Dean for Student Life for positions as Graduate Resident Tutors. Such positions provide room and board but no stipend.
Please refer to Graduate Students Office website for more information at:
http://odge.mit.edu/gpp/assistance/tutors/

Outside Employment

Normally the assigned duties, together with the allowed classroom registration, will command the full-time attention of the graduate student. As a result, students holding these appointments normally are not allowed to accept outside employment. In those very rare cases when it is appropriate for the student to seek limited employment beyond the appointment, explicit permission must be obtained from both the project supervisor and the Chair of Course XX Graduate Program Committee.

International Graduate Students: Please refer to the International Students Office website regarding information on On-Campus/Off-Campus eligibility for MIT F-1 and J-1 students:
http://web.mit.edu/iso/index.html

F-1 and J-1 students with a full RA position cover the 20 hours per week of work allowed by Department of Homeland Security while school is in session. No other on-campus or off-campus job can be held at the same time if a student has a RA or TA.

Please refer to the Graduate Students Office Policies and Procedures for more information about outside employment at: http://odge.mit.edu/gpp/

V. REGISTRATION

Proficiency in Writing Requirement

The ability to write clearly and succinctly is an essential skill for a successful career as an engineer or a scientist. Every new graduate student is required to demonstrate, in an online examination given each summer, the level of his/her proficiency in writing English. Staff members of the MIT Writing Program administer the online examination. On the basis of the examination results, recommendations may be made for remedial work. The Graduate Student Office notifies students whether they passed, performed marginally (and are therefore required to complete one or more workshops in technical writing) or failed and must register for and complete one designated writing subject with a grade of A or B. Students with an undergraduate degree from MIT are not required to take the writing examination.

English Requirement

An incoming graduate student for whom English is not the first language is required to take the English Evaluation Test (EET). The MIT English as a Second Language (ESL) Program gives this test at MIT before registration day. As a result of this test, if a subject is "Strongly Recommended" OR "Recommended," the student is **required** to register for and pass (with at least a C) the ESL subject suggested. The student is urged to take the subject the first academic semester of registration, but is allowed to delay taking it by one academic semester. If the student does not earn a grade of "C" or better in the suggested English subject, the subject must be retaken the following semester.

Exceptions from the rules are only by (1) retaking the EET and receiving an "adequate" rating or (2) receiving a written approval by the Chair of the BE Graduate Program Committee following submission of a written petition for waiver of the rules. Students who violate any of the above regulations regarding the EET or the ESL subjects will be refused registration. The units for these ESL subjects will be counted against the maximum number of units a research assistant or teaching assistant is permitted to take, but will not be counted toward the student's degree requirements.

Academic Advisors

Each graduate student is associated with an advisor who plays an important role in the student's academic and research programs. For incoming, first-year graduate students, assigned academic advisors are members of Course XX Graduate Committee. The academic advisor's role in the first year is to help first year graduate students to navigate through the academic requirements of the program, to make recommendations and suggestions regarding elective choices, remedial coursework, etc. When a student selects a research topic and begins his/her thesis, the research supervisor becomes the student's research advisor.

Prior to Registration Day (fall and spring terms of the first year), the student's subject selection must first be approved by the advisor before the Graduate Officer can authorize registration on Registration Day. Advisor approval should also be obtained for any subsequent subject add/drop actions during the term (no additional authorization by the Graduate Officer is required).

Research Advisor(s) Selection

To aid first year doctoral students in selecting a research advisor(s), the Department offers a series of research presentations during the fall term to inform the students about faculty research interests. All first year doctoral students are encouraged to attend those presentations. The presentations are usually scheduled in the afternoons on Mondays, Tuesdays,0 Wednesdays, and Fridays early during the fall term.

First-year doctoral students are also encouraged to pursue direct interactions with faculty members of potential interest along whatever avenues they find most helpful. These may include laboratory rotations involving hands-on work in one or more faculty research groups, and/or participation in research group meetings of other faculty research groups. Students are encouraged to get underway with arranging these interactions at the earliest opportunity in the Fall Semester, and it is up to their initiative to pursue; the Graduate Committee and Department leadership are available to be helpful in catalyzing these interactions. Each student should select two advisor preferences (1st and 2nd choices) at some point between the beginning of December and the beginning of February, and indicate their selection in the advisor selection form provided by Course XX Student Office. The advisor selection forms are due to the Student Office (16-267) by Registration Day of the spring term. The Department Chair will make every effort to grant each student his/her choice within funding and space limitations, and students will be notified of their research advisor(s) assignment as swiftly as is feasible.

Should a student wish to consider choosing a research advisor from a department other than Biological Engineering, he/she would be required to identify a formal co-advisor from the Biological Engineering faculty. Approval of non-Course XX faculty advisors will generally be given only when it is clear that a suitable BE faculty advisor cannot be found.

Occasionally, a research project does not proceed according to the expectations of the student, the research advisor(s), or both. Early recognition of the possibility of switching topics and/or research advisor(s) is an important factor in successfully managing this process. Any student contemplating a change of research advisor(s) should contact the Graduate Officer for consultation and assistance; such contemplated changes must be discussed in depth with Course XX Graduate Program Chair for consideration of approval. If the change in research advisor(s) has been approved, the BE Student Office must be notified.

Registration Procedures

First year graduate students are assigned an academic advisor for that first year in the doctoral program. Academic advisors meet with first year students who have questions regarding long-term academic plans and requirements for the graduate Program.

Continuing graduate students must pre-register on-line using WEBSIS during May for the summer and fall academic semester and in December for the spring academic semester. Complete as much information as possible and submit the form by the published deadlines; addition and /or deletions can be taken care of on Registration Day.

All registration material must be approved and signed off by the BE Registration Officer online (WEBSIS). An online Add/Drop form must be filed for all changes after registration day.

Credit Unit Requirement

There is no total credit unit requirement for doctoral students. Students registering for a thesis degree must specify a minimum of one credit unit each semester, but typically, the credit units are adjusted to yield a total load of 48 credit units for BE graduate students. International students must be registered for at least 40 units to be considered full-time to maintain their Visa status.

All students must register for the following subjects for every fall and spring semester:
20.200 Biological Engineering Student Seminars Total of 3 units
20.S952 Biological Engineering Speaker Series Total of 1 unit

Research and Thesis units may be adjusted to yield a total of 48 credit units for any given semester. Please note that thesis and research units may not be used to satisfy program coursework requirements.

V. DOCTORAL DEGREE REQUIREMENTS

The Institute specifies that a doctoral degree comprises creditable completion of an approved program of advanced study and a General Examination, in addition to a research dissertation of high quality based on original research. Also, the purpose of the doctorate is to develop in the individual the ability, confidence, and originality to grasp and solve major problems involving materials.

A. Departmental Doctoral Academic Programs

The Department of Biological Engineering offers a doctoral degree (PhD) in Biological Engineering with thesis field specified in the specific areas where the student has passed the required General Examinations, has satisfied the Academic Program elective subjects, has satisfied the thesis related subjects, and has completed a doctoral thesis. The choice of a Ph.D. or Sc.D. degree designation is left up to the student; the requirements are identical for both degrees.

B. Doctoral Subject Core

A two-subject core is required of all doctoral students:

Required Core: Two subjects	**term/yr will be taken**
20.420 Bimolecular Kinetics & Cellular Dynamics	Fall 2017
20.440 Analysis of Biological Networks	Spring 2018

It is assumed that incoming students have the undergraduate background necessary to tackle the core subjects. Students deficient in background may wish to take appropriate undergraduate subjects concurrently with the two core subjects in the first two semesters (Also see the Biochemistry and Cell Biology prerequisite requirement information below). If you are in doubt about your preparation for the core subjects, consult your academic advisor.

C. Advanced Subject Requirements beyond the Core

In addition to the core subjects, students are expected to take several restricted electives designed to add breadth and depth in the biological sciences and engineering. The goal is to find MIT subjects that best fit a student's thesis research project and career objectives. Advanced subjects other than those enumerated in the lists below are acceptable upon approval by advisor and Course XX Graduate Program Chair.
Please note: an elective subject is a 9-12 unit subject, if a subject is 6 units, students must take an ADDITIONAL 6-unit subject in order to count towards a 12-unit elective. Elective subjects must be letter graded; no P/D/F subject will be accepted as part of the program requirements.

Academic Program Restricted Electives

To enhance depth and breadth, the core subjects are supplemented by electives in science and /or engineering. The student in consultation with the advisor chooses four elective subjects. Elective subjects in four categories are acceptable upon approval by advisor and, for the subjects not listed here, the BE Graduate Program Chair:

1- Biological Engineering Restricted — one subject

To provide breadth in biological engineering, at least one graduate-level course beyond the Core Classes must be selected from the following group:

- 20.201 Mechanisms of Drug Actions
- 20.405 Principles of Synthetic Biology
- 20.410 Molecular/Cell Tissue Biomechanics
- 20.415 Physical Biology
- 20.430 Fields, Forces, and Flows in Biological Systems
- 20.450 Molecular and Cellular Pathophysiology
- 20.463 Biomaterials Science and Engineering
- 20.490 Computational & Systems Biology

2- Biological Engineering Unrestricted Elective — one subject
One graduate level Course 20 subject

3- Engineering/Science — one subject
To provide breadth in engineering or science, at least one graduate-level subject approved by the BE Graduate Committee Chair or Co-Chair must be selected.

4- Science & Biological Science — one graduate level Course 7 subject
To provide a firm foundation in modern biology, the student will be expected to have biochemistry and cell biology as prerequisites and then select one graduate-level subjects in biological science. If biochemistry and/or cell biology have not been previously taken, it/they must be taken as remedial undergraduate subjects (7.05 or 5.07 for biochemistry, 7.06 for cell biology) before taking the graduate-level subject.

D. Grading Policy on Subjects Taken to Satisfy Departmental Requirements

Graduate Students are generally expected to receive a grade of "B" or higher in any subject taken to satisfy a Departmental Requirement, grades below "B" are normally considered to be unacceptable as a measure of progress towards degree objectives. Departmental requirements include:

- Two Core Subjects: 20.420, 20.440
- BE Restricted Elective: 20.201, 20.405, 20.410, 20.415, 20.430, 20.450, 20.463, 20.490
- BE Unrestricted Elective: Any Course XX subject
- Engineering/Science Elective
- Science & Biology Elective

E. General Examination for the Doctorate

The Institute mandates that general written and oral examinations be set for doctoral students. The student must pass both written and oral examinations to become a **Candidate** for the doctoral degree. Either part, once passed, need not be retaken (unless other arrangements are made per Graduate Committee recommendation).

General Written Examination
The Department sets a General Written Examination for both tracks, offered in the end of spring semester of the first year, based on the two-subject graduate core material. The Graduate Program Committee, constructs this examination, arranges for its grading and adjudicating of the students' performances. Students must sit for this examination after the first **two** semesters in residence.

The examination is given in one day (2 questions, each two hours long, open book and notes). Questions focus on material from each of the core subjects. The purpose of the exam is to assess how well students can integrate and apply the fundamental tools and approaches laid out in the core curriculum. Mastery of

the material in the core subjects is an important part of this, and students' grades in those courses provide one measure of their accomplishments to date. Equally important is that students are able to go beyond the compartmentalized nature of the material in those courses, and solve problems that cross the various subject boundaries. The exam is designed to provide that additional type of evaluation. Copies of previous Written Examinations are available in the First Year Office Room 26-007 as well as the Academic Office, Room 16-267.

In considering the students' successful completion of the written exam, the Graduate Program Committee considers as an integrated whole the student's performance in the core subjects, other subjects, and the student's progress in pursuing a research program, along with his/her performance on the exam itself. If the Committee deems a student as having successfully satisfied all of the above as an integrated whole, she/he becomes a **Qualified Doctoral Registrant** and is eligible to sit for the Oral Examination in the second year. The Graduate Program Committee Chair will notify students and their advisors of the results of the Written Exam. Occasionally, students whose performance on the exam, while passing overall, is highly deficient in one area or another may be given a Conditional Pass. The student must then successfully accomplish additional work specified by the Committee in order to make up the deficiency and be allowed to proceed further.

General Oral Examination

The formal presentation of the Thesis Proposal will serve as the Oral Examination. The purpose of the Oral Exam is to test the student's ability to explain their thesis project, defend their scientific rationale, and propose alternate approaches, as necessary. The nature of the proposal may vary, depending on the project, but it should provide motivation as well as describe and justify the envisioned approach along with summarizing progress made to date. Preliminary results supporting the proposed research are beneficial, but not required, for the Thesis Proposal or the Oral Exam.

The Thesis Proposal/Oral Exam must take place by December 1 of the 3rd year, with the specific date scheduled before the beginning of the Fall Semester of the third year. If the student and advisor are convinced that a delay would serve the student's interests better, they must petition the Graduate Committee by August 1st of the summer following the 2nd year with their reasoning along with their commitment for a target date; the Graduate Committee will approve or deny the petition request. Failure to complete the Thesis Proposal/Oral Exam according to this policy will constitute unsatisfactory progress with respect to subsequent enrollment and funding support. Under these circumstances the student will not be able to register for the spring semester of their 3rd year.

The student is responsible for arranging the Thesis Proposal/Oral Exam meeting with the Thesis Committee Members and for reserving the location (plan for the meeting to take two hours). Generally, this meeting should be arranged at least two months in advance because it may be difficult to find a mutually agreeable time for all involved. Once this meeting has been scheduled, the Thesis Committee members and the Academic Office must be notified by e-mail about the day, time, and location of the presentation. The Thesis Committee constituted for the Oral Exam may change over the course of the student's research, as determined by the student and advisor with approval by the Graduate Program Chair. Beyond administration of the Oral Exam, the Thesis Committee is meant to provide guidance on the various aspects of the student's project; Thesis Committee members should therefore be selected with this goal in mind.

The student should be sure to register for **Thesis Proposal (20.951)** for 0-24-0 credit units during the term in which the Proposal is defended.

At least one week prior to the Thesis Proposal presentation, the student should deliver a copy of the Thesis Proposal to each of the Oral Exam Committee Members and to the Academic Office.

The student should prepare a 30-minute presentation. The Oral Exam Committee members will have read and thought about the Proposal ahead of time. Given that the meeting lasts up to two hours, there will be ample time for questions/discussion during your presentation. If questions arise about the format or style of the presentation, the student should contact the Oral Exam Committee Chair. The student should expect to be examined in depth on subject matter directly and tangentially related to all aspects of the Proposal. The questioning need not be restricted to the Proposal itself, but may expand into areas impinging on the Thesis topic.

The day of the presentation, the student should give the thesis chair an "Oral Examination for the Doctoral Degree" form. The Committee Chair must complete this form to confirm the outcome of a Thesis Proposal/Oral Exam Presentation. The completed form should be submitted along with any comments or recommendations made by the Thesis Committee to the Academic Office. From there, copies will be distributed to the student, the advisor, and the Committee Chair. If the Proposal presentation is acceptable, a "Pass" grade will be recorded for 20.951.

F. Minor Requirement for the Doctorate

Philosophy of the Minor Requirement

There is no Institute requirement of a minor for the doctoral degree. At this time the BE Department does not have an official minor requirement. A student interested in pursuing a minor along with the doctoral degree must discuss with and gain approval of their research supervisor(s).

The Graduate Program Committee Chair must then approve the proposed program. A program of study should be approved *before* it is embarked on, and therefore should be proposed early in a student's doctoral program. Changes in a program must be approved through a "revised" minor proposal submitted to the Chair of the Graduate Committee. The student's research supervisor must sign and approve the revised minor proposal. (See Form in Appendix)

The program of study that constitutes a minor must be well separated from the student's Academic Program subjects and thesis research area. Normally this means that the subjects are taken outside the Department, in a field not directly related to science and engineering.

The subjects taken to satisfy the Minor Requirement must be at an advanced level. It is recommended that two related *graduate level* courses be taken (24 units). Minor Programs composed of one graduate level and one advanced undergraduate level course (24 units), *or* three advanced undergraduate courses (33 units), *that were not used to obtain a bachelors or masters degree*, **may** also be acceptable. An exception is a minor in a beginning language sequence where two 9-unit G subjects would most likely be approved.

Proposal for a Minor Program

Students must submit a Request for Minor Approval Form outlining the proposed Minor Program to the Graduate Program Committee for approval. The form must include:

a. A description of the student's prior work in the proposed area if any;

b. An explicit demonstration that the proposed program fulfills all of the requirements for the Minor Program;

c. Attached copies of the catalogue descriptions of all subjects included on the form;

d. An endorsement of the proposal by the student's research supervisor stating the program is coherent and distinct from both the student's thesis research and the field in which the student has taken the Oral Examination.

G. Subjects Taken Outside MIT

Students with demonstrated professional competence (for instance, a graduate degree) in a field separate from Biological Engineering may petition the Graduate Program Committee to use that experience to satisfy the Minor Requirement. Units and subject level requirement are the same as for subjects taken within MIT.

H. Foreign Language

There is no foreign language requirement for the doctorate in Course XX. Candidates for whom English is a second language should take pains to ensure that their thesis is rendered in Standard English. The supervisor is not obligated to rewrite substantial portions of the thesis into acceptable forms.

I. The Doctoral Thesis

Doctoral Candidates (who have passed the General Examination) must complete a doctoral thesis that satisfies the Institute and Course XX requirements in order to receive the doctoral degree. General Institute requirements are described in *the MIT Bulletin* and in the *Graduate Education Manual*. Department's requirements and procedures are described below.

Ph.D. Thesis Committee

The student and research supervisor should agree upon members of a Thesis Committee and propose a Committee to the appropriate Graduate Program Committee Chair. During the summer of the second year, the student must submit the PhD Thesis Committee form to the Graduate Committee Chairs (Prof. Bathe, copy to Academic Office) to request approval of the Thesis Committee membership. The Committee should be comprised of the thesis advisor(s) plus a minimum of two additional members, at least one of whom must be a member of the BE faculty. The Committee Chair (who presides at all Committee meetings, including the Oral Examination) must be a BE faculty member.

The Ph.D. Thesis Committee has the responsibility of advising a student on all aspects of the thesis experience, from the proposal process through the preparation and defense of the final document. The Thesis Committee must be approved prior to the scheduling of the thesis proposal/oral exam presentation, which must take place in the spring academic semester following the spring semester in which the General Written Exam is successfully completed.

It is expected that the student and supervisor will hold progress reviews with the entire Thesis Committee at least once a year. In addition to the Oral Exam/Thesis Proposal, the student must eventually present at least two Regular Thesis Committee Meeting Reports (one of which must be a Final Thesis Committee Meeting Report) and a Thesis Defense to the Thesis Committee. Progress Reports are required once a year or more frequently if the Thesis Committee so requests. More frequent one-on-one meetings are strongly recommended. Thesis Committee Member changes must be approved by submitting a petition to the Chair of the Graduate Program Committee.

The first Progress Report must be held within one year of the Thesis Proposal/Oral Exam presentation. One week before the Progress Report meeting, the student should deliver annotated Specific Aims to each of the Committee Members. The aims should be 2 pages long (at most/ 12pt font). After each up-to-date Specific Aim, please add a few sentences outlining the status of that aim.

At the Progress Report presentation, the student should hand out photocopies of slides to the Thesis Committee Members (generally, this will be a print out of a PowerPoint presentation). Also, the student should provide the Committee Chair with an "Oral Examination for the Doctoral Degree" form to complete and submit to Academic Office.

Thesis Proposal/Oral Exam

A doctoral Thesis Proposal is required by December 1st following the calendar year in which the Written Exam is successfully completed. This proposal consists of a document submitted to an approved Thesis Committee at least one week prior to an oral presentation of the proposal to the Committee and a general audience. The document should not exceed 20 printed pages; exceptions can be made by prior agreement with the thesis committee. The Thesis Committee must approve the Thesis Proposal but no letter grade is given.

Thesis Proposal Guidelines (with recommended page lengths)

Title Page (*One page*) Include the title, the date, your name and signature, the advisor's name and signature, and the notation "Thesis Proposal". Note that a signature from the Academic Office is also required to confirm that your proposal adheres to the format described here.

Abstract (*Less than 300 words on One page*) State the significance of the proposed research. Include long-term objectives and specific aims. Describe concisely the research design and methods for achieving these objectives. Highlight the specific hypotheses to be tested, goals to be reached, or technology to be developed, which are intended to be your original contributions. Avoid summaries of past accomplishments.

Overall Objective & Specific Aims (*One page Maximum*) Articulate the overall objective of your thesis project, and outline a set of specific aims by which your work is intended to accomplish this objective. Be sure to clearly state the hypotheses to be tested, goals to be reached, or technology to be developed.

Background & Significance (*Three to Five pages*) Sketch the background leading to the present research, critically evaluate existing knowledge, and specifically identify the gaps that your research is intended to fill. State concisely the importance of the research described in this proposal by relating the specific aims to the broad, long-term objectives.

Research Design & Methods (*Six to Eight pages*) Along with the Objective & Aims section, this is the most important part of the proposal. The majority of your time should be spent making this part of your proposal strong, direct, and completely clear. Describe the research design and the procedures to be used to accomplish the specific aims of the project; it is generally most effective to do this according to the same outline as in the Objective & Aims section. Include how the data will be collected, analyzed, and interpreted. Describe any new methodology and its advantage over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims. As part of this section, provide a tentative timetable for the project. Point out any procedures, situations or materials that may be hazardous and the precautions to be exercised.

Preliminary Studies (*Three to Four pages*; this section may alternatively be located before the Research Design & Methods section**)** Use this section to provide an account of your preliminary studies that are pertinent to your research project and that support your specific aims. Note: it is *not* necessary to have obtained a substantial amount of preliminary data in order to submit or defend the proposal, although it will be expected that you have begun to undertake some of the key methods to assess their feasibility.

Literature Cited (*No page limits*) List all references. Each reference must include the title, names of authors, book or journal, volume number, starting and ending page numbers, and year of publication. References should be limited to relevant literature.
References are not included in the page limits. However, only references pertinent to the proposed research should be included.

Appendix (*No page limits*) Copies of published or submitted articles pertinent to the proposed research for which you are an author may be included. Such publications are neither expected nor required at the time of Thesis Proposal presentation.

Format and Page Limitations Proposals must be single spaced using 12 pt font and 1 inch margins. Figures may be embedded into the text, but they must be readable. The font within figures must be at least 9 point and the figure captions must be at least 10 point.

Devote one page each for the title page, abstract and specific aims.

Use between 13–17 pages for the remaining sections (Background & Significance, Preliminary Results, and Research Design & Methods). Note that although the maximum recommended page limits for these sections add up to a total of 17 pages, you are expected to expand and contract these sections as you see fit so that the total is no more than 17 pages.

Page limits include both text and figures. References are not included in the page limits.

The total length of the document should not exceed 20 pages (including 3 pages for the title page, abstract and specific aims; not including references or appendices).

Guidelines on Annual Thesis Committee Meetings

Annual Meetings: The Department requires annual Thesis Committee meetings for all graduate students that are past their Thesis proposal stage. These meetings help to ensure satisfactory progress towards the student's intended defense and graduation dates. These meetings also help ensure seamless communication across the entire Thesis Committee on the student's aims, progress, and any issues encountered during their thesis research trajectory.

Meeting Preparation: Two weeks prior to each Committee Meeting, the student is encouraged to share an annotated set of Specific Aims with their Committee. The annotated Specific Aims should be approximately one to two pages long, with a few sentences describing the status of each Aim and a Gantt Chart showing the anticipated timelines for their completion. At the Committee Meeting, the student is encouraged to hand out hardcopies of their presentation slides to their Thesis Committee Members, which may include a summary of their Specific Aims. They should additionally bring hardcopies of their Thesis Committee Progress form for each Committee Member, which should be filled out by the student prior to the meeting.

Meeting Format: The Department encourages in-person meetings with all Committee members present whenever possible. However, the specific format of the Committee Meeting is determined by the Committee Chairperson, Advisor(s), and graduate student, and may alternatively consist of multiple sub-Committee meetings at different times/locations, and include video-conferencing to facilitate participation of all Committee members.

Plan-to-Defend Meeting: The Department recommends that the final, Plan-to-Defend Committee meeting be held at least **six months** prior to the planned Thesis Defense date. At this meeting, students are strongly encouraged to share with their Committee a Gantt Chart illustrating the timeline towards their defense date (see example attached), including specific objectives and deadlines leading up to the anticipated Defense.

Meeting Remediation: While the Department recognizes that there may be extenuating circumstances leading to a delayed annual Thesis Committee meeting, which do not merit withholding registration, the Department reserves the right to withhold registration if the one-year mark past the regular annual Committee meeting schedule has passed. This circumstance implies that two years have elapsed since the last regular Thesis Committee meeting, all e-mail reminders and meeting attempts have failed to realize a subsequent meeting, and the Graduate Committee has determined that withholding registration is in the best interest of the student.

Example Gantt Chart for the final, Plan-to-Defend Thesis Committee Meeting (December) prior to the Thesis Defense (May):

	DEC	JAN	FEB	MAR	APR	MAY	JUN
Plan-to-Defend Thesis Committee Meeting	■						
Manuscript Submission		■					
Thesis Writing			■	■			
Deliver Thesis Document & Verification Form to Committee					■		
Thesis Defense						■	
Thesis due to Academic Office						■	
Employment Start-Date							■

Doctoral Thesis and Oral Defense of the Thesis

The Department's long-standing emphasis on original research is a key element in the Candidate's educational development.

The thesis defense has two stages: i) a final Thesis Committee Meeting report, and ii) a defense. The final Thesis Committee Meeting report involves only the student and the Thesis Committee. The final thesis meeting must include all members of the Thesis Committee. In highly unusual circumstances, the Chair of the Graduate Committee may approve faculty absences or substitutions for the preliminary exam. Such approval must be obtained in writing at least one week in advance of the meeting. Approval is only possible with written support from the chair of the Thesis Committee and the faculty member to be replaced or absent.

At least one week prior to the final Thesis Committee Meeting, the student will hand deliver copies of the final thesis report document to the thesis committee members. The final thesis report usually will involve a brief presentation summarizing research results and the contents of the thesis document. The Thesis Committee will prepare a set of comments, suggestions, or requirement, as necessary for further experiments, more careful data analysis, more rigorous interpretation, or improved expression. If the Thesis Committee discovers major deficiencies, a second progress report may be required.

The Thesis Defense is open to the public. The defense can only be scheduled after all deficiencies identified in the final Thesis Committee meeting report have been addressed. In no case will the defense occur sooner than two weeks after the final Thesis Committee meeting. At least two weeks prior to the defense, the Candidate will hand deliver copies of the final thesis document along with the thesis verification form to the Thesis Committee members. The committee members must decide within these two weeks if the thesis document is acceptable to proceed to defense. If the thesis is unacceptable, the defense will be rescheduled following correction of the thesis. It is the student's responsibility to reserve a classroom for the Thesis Defense. If the student wishes to reserve one of the BE Classrooms (56-614, 16-220), they should contact the BE Academic Office, any other classroom reservation must be reserved through the Registrar's Office: classrooms.mit.edu

The defense begins with a formal presentation of approximately 45 minutes based on the thesis. The floor is then opened to questions from the general audience, which is thereafter excused. The Thesis Committee, and any other MIT faculty that wish to remain, continue the examination of the Candidate in private. The Candidate and any non-Thesis Committee faculty still present are finally excused from the room for the final Committee deliberations and decision. A majority yes vote is required to approve the thesis. It is the responsibility of the Thesis Committee Chair to give the Committee's decision whether the thesis is satisfactory or unsatisfactory to the Candidate and to the BE Student Office. In the event of vote not to pass, the Thesis Committee will make recommendations as to needed changes to render the thesis satisfactory. The revised thesis will then be submitted for a second final defense.

Note: Students are advised to keep in mind that the months of May and August tend to be the months where scheduling a presentation may be difficult because of faculty unavailability.

Thesis Format

Candidates should consult "Specifications for Thesis Presentation" (MIT, 2013), available on the web at **http://libraries.mit.edu/archives/thesis-specs/**

Students who would like assistance in improving their writing skills or in any stage of writing a thesis proposal, final thesis, and even resumes and job application letters should contact:

- BE Communications Lab 56-211 at 617-324-4564, staffed by the BE Communication Fellows, the Lab offers writing and speaking support for engineers by engineers.

- MIT Writing and Communications Center WCC, E18-233 at 253-3090 <writing-center@mit.edu>. The Writing Center offers individual consultations and advice about any writing problem and is open to all members of the MIT community.

Final Defense Requirements

Following the satisfactory completion of the Final Thesis Committee Meeting, doctoral students can commence the Thesis Defense process. The following Checklist describes in detail the procedures for preparing and submitting a Thesis pertaining specifically to the Doctoral Thesis Defense:

1. Student must meet all program requirements
2. Complete an Application for Advanced Degree (online - WebSIS)
3. Student must give the thesis Committee Chairperson a Thesis Defense Report form (Yellow Form, see appendix) to verify that thesis Defense was acceptable
4. Submit the following to BE Academic Office (16-267):
   a. Two copies of thesis **(printed on acid-neutral paper)** with original signatures:
      Title page should include: Your original signature, Advisor's original signature, Graduate Program Chair original signature (Mark Bathe).
      Second Page should include: List of all Committee members who voted in favor of your defense

   b. Microfilming fee applied directly to student bill

   c. Complete UMI form: http://libraries.mit.edu/archives/thesis-specs/images/umi-proquest-form.pdf

   d. Complete a Graduate Exit Survey online at http://web.mit.edu/surveys/grad/phdexit/

   e. Receive a receipt from Academic Office for submitted Thesis

J. Master of Engineering in Biological Engineering as Recommended by the Department of Biological Engineering

In special cases, a student may petition the Graduate Committee to recommend, on behalf of the Department, the awarding of a Master's degree (SM) without field specification. The requirements for this degree are a minimum of 66 units, approved for "G or H" credit, of which 42 units must be "Graduate H" level. The petition should be submitted early in the student's residence. Graduate Thesis or research units cannot be used toward the 66-unit requirement.

Required Subjects & Units
20.200 + 20.S952

-Plus-

Additional courses to be determined based on the student's needs/interests in consultation with the advisor. Please note: SM candidates are required to take a minimum of 66 graduate units of course credit; at least 42 of these units must be "H" level. Research (20.950) and Thesis (20.951 and 20.THG) do not count towards the unit requirement.

Thesis Requirement
The SM candidate must write and submit an acceptable Thesis in the field of Biological Engineering that is approved and signed by the research advisor and the Chair of the Graduate Program Committee. The format should follow the same format as the PhD thesis (P. 23). The student must provide a final version of the thesis to the Academic Office by the date posted on the MIT Academic Calendar. The thesis supervisor and the Chair of the Graduate Program Committee must sign the title page of the thesis. An internal Course XX thesis reader is required if the student's advisor is outside BE.

VI. RESEARCH EVALUATION PROCEDURES

Student-Supervisor Evaluations

Evaluation of a student's research performance is assisted by the Research Progress report, which is sent to all students registered for both 20.950 Research and 20.THG Thesis late in each regular semester (fall and spring). The Report is a questionnaire, which serves as an opportunity for both parties to get a better sense of progress on research project, the student's development, and the student/supervisor working relationship, as well as to plan for future progress. The student and supervisor may wish to fill out the questionnaires independently and then meet to discuss them; this approach has the advantage of promoting a more open discussion between the parties and helps reveal any underlying misconceptions that may exist.

After discussion of the questionnaire the supervisor will assign a grade of J (satisfactory) or U (unsatisfactory) for the student's registered for 20.THG thesis or a letter grade for students registered for 20.950 Research that semester. Both the student and the advisor must sign the form. The student is responsible for returning the signed form to the Academic Office (Room 16-267) or a grade will not be reported for that semester.

Assurance of Satisfactory Progress

The Registration Officer and the Graduate Program Committee are charged with ensuring that each student is making adequate progress in his or her graduate program. The Registration Officer is expected to oversee the student's course work, so that adequate progress toward the student's goals is being made. The Graduate Program Committee monitors the length of time taken for a degree.

Ten regular academic semesters, are typical for earning a doctorate in the Department. After the eleventh regular academic semester, the student should expect to receive a letter from the Chair of the Graduate Committee requiring a written evaluation of progress and a timetable for the completion of the degree requirements from the student and research supervisor. After thirteen regular academic semesters the Chair of the Graduate Program Committee will usually ask the Dean of the Graduate School to issue a formal warning threatening loss of registration if the doctoral degree is not completed during the next regular academic semester. The above listed time requirements must of course be interpreted in such a way as to allow for differences between students and differences between thesis projects. Changes in thesis topics and/or advisor, a hiatus in research support, disability, or parental responsibilities are just several of a number of good reasons why a student may take longer than average to complete a degree. The Graduate Program Committee will consider such mitigating circumstances very carefully before taking action.

VII. OFFICES & TELECOMMUNICATIONS

First year Offices

First-year students are assigned office/meeting space generally in the vicinity of Building 56. After completion of the first year, office space assignments are normally handled within one's research group. Depending on space allocation, first year student offices usually include: individual desks with shelve space, modular meeting tables, individual lockers, refrigerator, microwave, telephone, MIT network connection, wall clock, and in some instances a photocopier and printer.

When a student completes his/her choice of a research advisor, he/she moves into a laboratory or office space associated with the research group of the research advisor.

Facilities problems should be reported to the Academic Office at 617.253.1712. Problems arising from noise, personality, work habits, or manners should be resolved within one's office in a civil manner becoming of adults, when this fails, problems should be addressed to the Department's Graduate Administrator.

Telephones

Students usually have access to a telephone either directly within their first year office or within their research group. Several different classes of telephone service exist within MIT; the first year offices are equipped with telephones with Class B-2 service, which allows calling with MIT and metropolitan Boston, but does not allow long distance calling.

The Department pays for basic telephone charges, such as the monthly rental fee for the actual telephone and the monthly fee for basic phone service. Personal long-distance calls can be readily placed from MIT using calling cards issued by most of the long distance telephone companies. Instructions for use of the MIT telephones are provided in the *MIT Institute Telephone Directory*.

Electronic Mail

All MIT students can register for an electronic mail (E-mail) account on Athena, MIT's campus wide computing environment. Once a student is registered at MIT, an account may be obtained by going to any Athena cluster and selecting the "register for an account" option on the welcome screen. (The entry code for those public clusters which have a keypad may be obtained by asking a student who is entering or leaving a cluster.)

More details are available through Athena User Accounts in Information Systems (Room N42-140, x3-1325) or through Athena mini courses run by this office, which are publicized in The Tech, MIT's student newspaper, at the start of an academic semester. Course XX graduate students email addresses are automatically added upon enrollment to the Department's mailing lists, over which subjects such as seminar announcement, social hours, and Department policy are discussed. For more information, contact the BE Academic Office.

VIII. SAFETY

General Information

In addition to the general issues of personal safety in large cities such as Boston and Cambridge, research and education in science and engineering may involve a variety of chemical, biological, radiation and safety hazards in laboratories and shops. Both MIT and the Department of Biological Engineering place a high priority on personal security and on the health and safety of students and all employees in the work environment, as well as a special respect for the impact of MIT activities on the environment.

Environmental Health and Safety at MIT

Environmental health and safety at MIT is a two-way street, with strong emphasis placed on the health and safety of all members of the MIT community as well as on the impact of MIT research and teaching activities on the local and global environment. As such, MIT has implemented an Environmental Health and Safety (EHS) program designed to provide all of the necessary training for safe use of chemical, radiation and biological hazards as well as for general safety in the laboratory and shop settings. Each department and center has an EHS Coordinator who works with a member of the central MIT EHS Office that coordinates safety training and inspections of all MIT laboratories and living spaces.

Training begins during orientation week each August/September for new students in the Department of Biological Engineering with a mandatory safety presentation by the Department EHS Coordinator (Joseph Glogowski). This is a general training session designed to provide a broad overview of the EHS system in the Department and throughout MIT. Subsequent training must take place before any student will be allowed to undertake research in any laboratory at MIT, including teaching laboratories. Once a student joins a faculty laboratory, there is a requirement for additional training in areas appropriate for each individual laboratory, including radiation safety training, biohazards training and specialized training in the management and disposal of toxic chemicals. This training is reinforced with annual recertification training. Finally, each laboratory will have unique hazards with which students are obliged to become familiar; the EHS Officer for each laboratory and Center coordinates this training. The point of all of this training is preservation of your health and safety as well as that of your fellow students and laboratory mates and the health of the environment.

Environmental Health and Safety Contact Information:

During Business Hours: 2-EHSS (617-452-3477); the appropriate EHS program specialist will respond to your call in a few minutes.

During Weekends And After Hours: Contact the Department of Facilities Operations Center at 3-4948 (617-253-4948) and an EHS Team member will be paged.

Life-Threatening Situation: also dial 100 for Campus Emergency

Emergency Numbers

The following emergency numbers can be dialed from campus telephones:

MIT campus emergencies
(24-hour police, ambulance, fire, first aid, dean on call)
To report an emergency:
From a campus phone: 100
From a cell phone, pay phone, or off-campus: 617-253-1212

Emergency information line (for status of emergencies): 617-253-SNOW (7669)

MIT Medical (24-hour urgent care)
From a campus phone: 3-1311
From a cell phone, pay phone, or off-campus: 617-253-1311

Emergency closings (recorded updates)
617-253-SNOW (617-253-7669)

International SOS (emergency medical and security evacuation services for those traveling abroad on MIT business) (requires certificates)
617-253-2823

Facilities (24-hour emergency repairs)
From a campus phone: 3-4948
From a cell phone, pay phone, or off-campus: 617-253-4948

Saferide (campus transportation: 6:00pm - 3:00am)

From a campus phone: 3-2997
From a cell phone, pay phone, or off-campus: 617-253-2997

MIT News Office
From a campus phone: 3-2700
From a cell phone, pay phone, or off-campus: 617-253-2700

Information Center
From a campus phone: 3-4795
From a cell phone, pay phone, or off-campus: 617-253-4795

MIT Police
General business: 617-253-1212
Guest parking: 617-253-7276
Lost and found: 617-253-9753

Computer and Communications Outages
3-DOWN: 617-253-3696

Environment, Health & Safety Office
From a campus phone: 2-3477
From a cell phone, pay phone, or off-campus: 617-452-3477

Security and Emergency Management Office
From a campus phone: 8-7366
From a cell phone, pay phone, or off-campus: 617-258-7366

Telephone service
MIT directory assistance: 0 or 617-253-1000
Service problems: 617-253-4357

Safe Ride

The Parking and Transportation Office operates MIT's safety shuttle van known as SafeRide. SafeRide provides a safe means of transportation at night within and around the MIT campus.

Safe Ride operates 7 days a week from:

6:00 P.M. to 3:00 A.M. Sunday through Wednesday

6:00 P.M. to 4:00 A.M. Thursday through Saturday

This service is free and available to all members of the MIT community. The Saferide vans are driven by service assistant employees of Standard Parking, who carry two-way radios for a direct link to the SafeRide Office and the Campus Police. In addition, the Campus Police will accommodate requests for after hour safety rides until daylight.

Safe Ride Contact Information:
The SafeRide Office
(617)253-2997
mitparking@mit.edu

IX. HOUSING

The Department of Biological Engineering provides no assistance with student housing; however, considerable assistance is available within the Institute. A good reference for both on-campus and off-campus housing is available at: http://studentlife.mit.edu/housing/graduate-family-housing

MIT has on-campus housing for 30% of its graduate students, even though it is desired by 50% of all graduate students. Assignments to the six buildings on campus generally run for one academic or calendar year beginning September 1 and are made by the Graduate Housing Office, Room E32-133, which should be contacted for further information.

Most graduate students reside off-campus either by choice or by necessity. The Off campus Housing, Room W59-200, provides listing of apartments and houses for rent, listings of people looking to share housing, maps of surrounding communities, and free telephones to help with your housing search.

For more information please consult the Housing Office Website at:

http://housing.mit.edu/

http://studentlife.mit.edu/housing/graduate-family-housing

http://studentlife.mit.edu/housing/campus-housing

X. MIT NONDISCRIMINATION POLICY

The Massachusetts Institute of Technology is committed to the principle of equal opportunity in education and employment. The Institute prohibits discrimination against individuals on the basis of race, color, sex, sexual orientation, gender identity, religion, disability, age, genetic information, veteran status, or national or ethnic origin in the administration of its educational policies, admissions policies, employment policies, scholarship and loan programs, and other Institute administered programs and activities; the Institute may, however, favor US citizens or residents in admissions and financial aid. [1]

The Vice President for Human Resources is designated as the Institute's Equal Opportunity Officer. Inquiries concerning the Institute's policies, compliance with applicable laws, statutes, and regulations, and complaints may be directed to Lorraine Goffe, Vice President for Human Resources, Room NE49-5000, 617-253-6512. In addition, inquiries about Title IX (which prohibits discrimination on the basis of sex) may be directed to the Institute's Title IX coordinator, Sarah Rankin, Room W31-223, 617-324-7526, titleIX@mit.edu. Inquiries about the laws and about compliance may also be directed to the United States Department of Education, Office for Civil Rights, Region I, 5 Post Office Square, 8th Floor, Boston, MA 02109-3921, 617-289-0111, OCR.Boston@ed.gov.

XI. HARASSMENT

Both MIT and BE stress that it is vitally important for members of an academic community to exhibit high ethical standards in their interactions with one another. Below is MIT's policy regarding this issue; further information can be found in the Policies and Procedures. In addition, a comprehensive guide, Dealing with Harassment at MIT, will be distributed to all incoming graduate students during their first academic semester at MIT. This guide describes MIT's system for handling concerns or harassment complaints – complainant, respondent, complaint-handler, and bystanders. Extra copies will be available through the Information Center, Room 7-121

Policy on Harassment

Harassment of any kind is not acceptable behavior at MIT; it is inconsistent with the commitment to excellence that characterizes MIT's activities. MIT is committed to creating an environment, in which every individual can work, study, and live without being harassed. Harassment may therefore lead to sanctions up to and including termination of employment or student status. Harassment is any conduct, verbal or physical, on or off campus, that has the intent or effect of unreasonably interfering with an individual or group's educational or work performance at MIT or that creates an intimidating, hostile, or offensive educational, work, or living environment. Some kinds of harassment are prohibited by civil laws or by MIT policies on conflict of interest and nondiscrimination. Harassment on the basis of race, color, gender, disability, religion, national origin, sexual orientation, or age includes harassment of an individual in terms of a stereotyped group characteristic, or because of that person's identification with a particular group. Sexual harassment may take many forms. Sexual assault and requests for sexual favors that affect educational or employment decisions constitute sexual harassment. However, sexual harassment may also consist of unwanted physical contact, requests for sexual favors, and visual displays of degrading sexual images, sexually suggestive conduct, or offensive remarks of a sexual nature.

The Institute is committed under this policy to stopping harassment and associated retaliatory behavior. All MIT supervisors have a responsibility to act to stop harassment in the areas under their supervision.

Any member of the MIT community who feels harassed is encouraged to seek assistance and resolution of the complaint. MIT provides a variety of avenues by which an individual who feels harassed may proceed, so that each person may choose an avenue appropriate to his or her particular situation. Institute procedures are intended to protect the rights of both complainant and respondent, to protect privacy, and to prevent supervisory reprisal.

See Dealing with Harassment at MIT http://web.mit.edu/communications/hg/ for more information.

XII. REFS (Resources for Easing Friction and Stress) Program in BE

Resources for Easing Friction and Stress for Biological Engineering (BE REFS) is a graduate student support network of trained BE graduate student mediators (Refs) who specifically support the BE community. The Refs' roles are to be a referral source and to be an aggregator of information/advocate for students in the department. Primary emphasis is on graduate student support, but Refs are also available to undergraduates, postdoctoral fellows, faculty or staff in BE. Refs act as confidential sounding boards with whom interaction is voluntary and confidential. Our mission is to help our peers deal with difficult situations and increase student well-being in the department.

BE REFS aims to...

- Provide a graduate-student-driven, centralized, department-wide resource to help students cope with the stresses of graduate school and negotiate difficult situations, whether between students, between students and any other member of the department or MIT, or between students and people in their personal or private lives.
- Complement the BE Graduate Board in collecting anonymous information on areas of the graduate experience that may be improved.
- Direct students to appropriate resources available to them at MIT.

Who are we and How to find us:
We are graduate students trained in conflict management by conflictmanagement@mit.edu. The BE REFs team also has faculty and staff coordinators who advises us and serves as a liaison with departmental faculty and staff.

We can be reached at be-refs@mit.edu or more information can be found on our website: http://berefs.com/ You should also feel free to contact us individually and in person.

We keep all conversations in confidence and will only share with the permission of the visitor or party - except in the unusual situation of imminent risk of serious harm to self or others.

XIII. CONFLICT OF INTEREST, COMMITMENT

Although there is no policy against working outside of MIT while a registered student, there are issues of conflict of interest and conflict of commitment. The student interested in working part time off campus, and who is a US citizen or permanent resident, should first speak to his or her research advisor about the nature of the proposed work. The advisor must be assured that the work will not compromise the time that the student is expected to devote to research at MIT, and that the outside work does not compromise or infringe upon patent or intellectual property rights related to the student's MIT research. The student also must ensure that the outside work does not violate any departmental policy.

Under certain conditions students may benefit from part time involvement in outside professional activities of faculty members. Prior approval for students wishing to engage in such activities can be granted by the department head after suitable discussion with the faculty member and student.

In considering such arrangements, faculty should be guided by the need to avoid conflicts of interest and to avoid infringement of the student's academic duties and rights. Generally, if the faculty member has a role in supervising the student's thesis or in supervising the work of the student as a graduate teaching assistant or Instructor-G, such employment should not be undertaken, thus avoiding potential conflicts of interest in the evaluation of the student's performance. If the faculty member does not have a role in supervising the student's thesis and/or the student's work as a teaching assistant or Instructor-G, the employment may be undertaken. If the outside work is related to the student's thesis, special care should be expended to avoid conflict.

Faculty members who are already associated with students in outside employment should disqualify themselves from becoming research supervisors, academic program advisors, or examiners of those students. Within an MIT research laboratory or academic unit, faculty members should take care not to give the impression of favoritism to those students with whom they are associated in outside employment.

Generally, full time research assistants should not be employed in outside professional activities of faculty, both to avoid conflicts of interest and in light of the obligations of the full time research assistant. A part time research assistant may engage in such employment if the outside work is not thesis-related and if the faculty member is not his or her supervisor.

MIT policy regarding joint outside professional activities involving faculty and students may be found in MIT Policies and Procedures section 4.5.2.

Members of the Institute community may choose to seek advice on these personal questions from their department heads, Personnel staff, Medical Department staff, the Special Assistants to the President, or other counseling resources of the Institute. In addition to these resources, students also have available to assist them their faculty advisors, the faculty in residence, and the counseling resources of Office of the Dean for Students and the Office of Graduate Education.

XIV. ABSENCES FROM THE INSTITUTE

Research mandates or personal circumstances may compel graduate students to be absent from MIT for brief periods or for extended periods of time. The Graduate School has quite specific regulations governing such absences and subsequent return to the Institute, which are described in MIT's *Graduate Education Manual* and implemented by the Dean of the Graduate School and the Committee on Graduate Programs (CGP). In the first instance, all proposed absences must be discussed with and approved by the student's supervisor and submitted for Departmental approval to the Chair of the Graduate Program Committee (c/o Room 16-267). In most cases, additional approval will have to be sought from the CGP through the office of the Dean of the Graduate School.

Brief Absences for Research Conducted Elsewhere

Thesis research is ordinarily done in residence at the Institute. However, on some occasions research may need to be conducted elsewhere – at a national laboratory or national facility, with collaborators at another university or industry, at a research sponsor's premises, etc. If the absence from the Institute is only for a few days, it is necessary only to ensure that the thesis supervisor is adequately informed. For research elsewhere conducted for periods longer than one week, approval must be sought in writing from the Chair of the Graduate Committee after establishing compelling reasons. A copy of the Graduate Committee Chair's approval must be filed with the Graduate Students Office. Such approval must be obtained before leaving the Institute, with ample time for consideration by the Graduate Committee Chair and notification of the BE Graduate Education Office.

Thesis Research in Absentia

Thesis research is ordinarily done in residence at the Institute. However, on some occasions and in some fields, work such as the gathering of data away from the Institute may be essential or desirable. Approval for thesis research to be done in absentia is given in writing by the departmental graduate officer, after establishing that there are compelling educational reasons to approve thesis research in absentia. A copy of that approval must be filed in the Office of the Dean for Graduate Education.

Such approval must be requested before leaving the Institute, with ample time for full consideration by the department and/or notification of the Office of the Dean for Graduate Education.

Students must register and pay full tuition while pursuing thesis research in absentia. In unusual circumstances, the Dean may set a special tuition rate for such students.

The following requirements must also be met:

- The opportunity for the continuing intellectual growth of the student must be clearly evident.
- The thesis must continue to be supervised by an Institute faculty member, or by a senior staff member approved by the department.
- The student must be registered as a full time resident during the final term.
- A doctoral student must normally have completed the general examination requirement for the degree, and devote full time to thesis research in absentia.

Non-Resident Doctoral Thesis Research Status

Nonresident status is intended for doctoral students who have completed all requirements other than the thesis. Thesis research is ordinarily carried out while the student is in residence at the Institute. However, on some occasions, it may be essential or desirable that the student be absent from the campus during a portion of his or her thesis research or writing. Permission to become a nonresident doctoral candidate must be obtained from the Dean for Graduate Education at least one month prior to Registration Day of the term during which the student wishes to register in this category (a fee will be assessed for late requests).

A student who is permitted to undertake nonresident thesis research must register as a nonresident doctoral candidate and pay a substantially reduced tuition. For the first three regular academic terms, tuition is approximately 5 percent of regular full tuition. Thereafter, it is charged at approximately 15 percent. The Schedule of Fees sets forth the specific tuition charges.

Nonresident students have limited access to the facilities and academic life of the Institute. However, they are permitted access to the libraries and athletic facilities and have the same student health privileges and options as resident students upon payment of the appropriate fees. For the first three semesters of nonresident status, a student may receive fellowship support from MIT for an amount up to 5 percent of tuition per semester. After the third semester, nonresident students can no longer receive fellowship support from MIT. Eligibility for federal loans and reimbursement-based external tuition fellowships remain unaffected for the length of nonresident tenure.

Prior to submission, the request form must be approved by the student's thesis supervisor and by the departmental graduate officer from the student's department of registration. Justification for the nonresident status must be set forth in the proposal. This may include: field work or data collection; use of special or unique facilities at other laboratories; the need to accompany a thesis supervisor who transfers to another institution prior to completion of thesis research; simultaneous employment unrelated to the Institute and also unrelated to the thesis research. Arrangements must be described through which the thesis research will be supervised by a member of the faculty or a senior staff member approved by the department.

Prior to seeking approval, the student must have completed the general qualifying examinations and must have been in residence as a regular graduate student for a period of at least four regular terms (periods of residence at other educational institutions, as a special student or during the summer session at MIT may not be counted in meeting this requirement). The student must also have submitted a thesis proposal that indicates approval by the supervisor and the appropriate departmental committee. A summary of the proposal must be included with the request for nonresident status submitted to the Dean for Graduate Education.

Nonresident doctoral candidates are not eligible to reside in student housing or to be graduate resident tutors. Upon approval for nonresident status, students must terminate their current license agreements (with adherence to current policies) and forfeit their continuing housing status, if applicable. Students granted this status may subsequently request to be put on a waiting list and, when space is available, may be assigned housing on a semester-by-semester basis.

Should space become available after all other fully registered students have requested and have been granted an assignment on campus, Housing will then offer the nonresident candidate an available space. Students on the waiting list will be offered a space in the order of date applied. Housing will try to allow

students already in graduate housing who move to nonresident status and who receive an offer from the waiting list to stay in their current location, but this is not guaranteed.

Students cannot accept employment as academic, administrative, or research staff, or as hourly employees at MIT, Lincoln Laboratory, or the Charles Stark Draper Laboratory while registered as nonresident graduate students. Initial approval for nonresident status is granted for two successive regular terms in the same academic year. Registration as a nonresident doctoral candidate is not required during the summer session unless the student is returning to resident status to complete degree requirements and submit a thesis. Continuation for two additional periods of two regular terms each may be granted by the Dean for Graduate Education if the student's progress is satisfactory and if the thesis supervisor and the department so recommend. Generally, a maximum of six regular terms in nonresident status will be permitted. Longer periods will need written endorsement from the department of registration. Following completion of the nonresident period, the student must return to resident status for completion and presentation of the doctoral thesis. If the thesis is completed during the first term of resident status (including summer session), tuition will be prorated on a weekly basis subject to a minimum charge of one half the tuition for a regular term.

Registration must be continuous. If a student is withdrawn and then readmitted to resident status to submit a thesis and receive the doctoral degree that same term, tuition will be 1.5 times the full tuition for a regular term.

Leaves of Absence

Personal or professional circumstances may sometimes compel a student to withdraw from Graduate School, for example to reconsider career objectives, provide financial stability through temporary employment, accompany a spouse to a posting in another city, attend to family obligations, give birth, etc. There are no formal provisions for leaves of absence for graduate students for these reasons (except Child birth, see Child birth section), rather, leaves of short duration for personal reasons, such as family business or a brief personal illness or illness in the family, can be granted at the discretion of the faculty supervisor and are to be negotiated on a case by case basis. The only formal option for a leave available to graduate students is a medical leave of absence, which is intended for personal medical problems or emergencies only, not those related to family members or others. Students are advised to seek advice from the graduate administrator, or the Department's graduate officer, to discuss how best to handle this issue.

If a student is absent for longer than one-year (two regular academic semesters and one summer academic semester) the student is then considered withdrawn from MIT and will need to apply through the Department for readmission to the Institute. A letter should be sent to the Chair of the Admissions Committee (c/o Room 16-267), supplying the relevant details. Readmission cannot be guaranteed, and the decision will be based on the student's prior record as a graduate student, circumstances of the withdrawal, period of absence, prospects for research support upon readmission, and other relevant factors. In some cases re-entering students must arrange for a new project and/or research support.

International students are not permitted a leave of absence under any circumstances since there are serious immigration implications for an international student who wishes to take a leave of absence. International students would most likely be withdrawn from the program and their student visa will be revoked. Students wishing to return from withdrawal status and resume the program need to apply through the Department for readmission to MIT as well as re-apply for Visa status. International Students

considering a leave MUST check with the International Students Office for further detailed information regarding Visa status.

Medical withdrawal

A medical withdrawal may be granted or required for mental and/or physical conditions that interfere with a student's ability to participate in campus life including their ability to complete or make satisfactory progress towards academic goals. For undergraduates, medical withdrawals are granted or required with the assistance of a counseling dean in Student Support Services and require appropriate medical documentation. For graduate students, medical withdrawals are granted or required by the Office of the Dean for Graduate Education and require appropriate medical documentation and a letter of support from the department from which the student is seeking a medical withdrawal. Medical withdrawal is not intended as a device to shield a student from unsatisfactory progress or any other academic irregularity. Students will need to make an appointment with a counseling dean or graduate education dean as appropriate to discuss their plans.

For detailed information, please consult http://odge.mit.edu/gpp/

Personal leave

Leaves of short duration for personal reasons, such as family business or a brief personal illness or illness in the family, can be granted at the discretion of the faculty supervisor and are to be negotiated on a case by case basis.

Childbirth Accommodation

Applicability: This policy applies to any full-time, registered graduate student woman. It is limited to women who anticipate giving birth and does not apply to adoption or to men in support of their wives or partners during childbirth.

The Office of the Dean for Graduate Education administers the policy through the petition process. This petition does not require departmental approval but is reviewed and approved by the Dean for Graduate Education.

For detailed information, please consult the Office of the Dean for Graduate Education at

http://odge.mit.edu/gpp/

XIV. Course XX PH.D. PROGRAM REQUIREMENTS AT A GLANCE

First Year

- Research Advisor selection by Registration Day of the Spring Term
- Written Qualifying Exam: Late Spring Semester (June)

Fall Semester	Spring Semester
20.420 (12 Units)	20.440 (12 Units)
Elective (12 Units)	Elective (12 Units)
20.200 BE Seminar (3 Units)	20.200 BE Seminar (3 Units)
20.952 BE Seminar (1 Unit)	20.S952 BE Seminar (1 Unit)
20.950 (9-44 Units)	20.950 (9-44 Units)
Total Units= 40-48	Total Units= 40-48

Summer term, sign up for research only (20.950) for a total of 24 units of credit

Second Year

- Teaching Assistantship
- Oral Qualifying Exam/Thesis Proposal: December

Fall Semester	Spring Semester
20.950 Research (9-44 Units)	20.951 Thesis Proposal (24 Units)
Elective (12 Units)	Elective (12 Units)
20.960 Teaching Experience (12 Units)	20.960 Teaching Experience (12 Units)*
20.200 BE Seminar (3 Units)	20.200 BE Seminar (3 Units)
20.952 BE Seminar (1 Unit)	20.S952 BE Seminar (1 Unit)
Total Units= 40-48	Total Units= 40-48

Summer term, sign up for research only (20.950) for a total of 24 units of credit

Third Year

- Progress Report to Thesis Committee

Fall Semester	Spring Semester
20.951 Thesis Proposal (24 Units)*	-
20.THG (44 Units)	20.THG (44 Units
20.200 BE Seminar (3 Units)	20.200 BE Seminar (3 Units)
20.952 BE Seminar (1 Unit)	20.S952 BE Seminar (1 Unit)
Total Units= 40-48	Total Units= 40-48

*If not taken in the prior spring/summer semester
Summer term, sign up for research only (20.950) for a total of 24 units of credit

Fourth Year

- Progress Report to Thesis Committee

Fall Semester	Spring Semester
20.THG (44 Units	20.THG (44 Units
20.200 BE Seminar (3 Units)	20.200 BE Seminar (3 Units)
20.952 BE Seminar (1 Unit)	20.S952 BE Seminar (1 Unit)
Total Units= 40-48	Total Units= 40-48

Summer term, sign up for research only (20.950) for a total of 24 units of credit

A P P E N D I X

GRADUATE FELLOWSHIP INFORMATION

The fellowships listed below are for U.S. citizens and permanent residents unless otherwise noted.

National Science Foundation (NSF) Graduate Research Fellowship Program

GRF Operations Center Suite T-50
1818 N Street NW
Washington, DC 20036

Fastlane Application Phone: 866-673-4737
E-mail: fastlane@nsf.gov
Homepage: https://www.fastlane.nsf.gov/grfp

National Defense Science and Engineering Graduate (NDSEG) Fellowships

American Society for Engineering Education
1818 N Street NW, Suite 600
Washington, DC 20036

Phone: (202) 649-3831
Fax: (202) 265-8504
E-mail: ndseg@asee.org
Homepage: http://www.asee.org/ndseg

Department of Energy Computational Science Graduate Fellowships

DOE CSGF Program Coordinator
1609 Golden Aspen Drive, Suite 101
Ames, IA 50010

Phone: (515)956-3696 **Fax:** (515) 956-3699
Homepage: http://www.krellinst.org/csgf/index.shtml

Fannie and John Hertz Foundation Fellowships

2456 Research Drive
Livermore CA 94550-3850

Phone: (925) 373-1642 (8-1 PST only) **Fax:** (925) 373-6329
Homepage: http://www.hertzfndn.org

Fellowships for Women

American Association of University Women (AAUW) Educational Foundation

Selected Professions Fellowships
Department 60
301 ACT Dr.
Iowa City, IA 52243-4030

Phone: (319) 337-1716, extension 60
E-mail: foundation@aauw.org
Homepage: http://www.aauw.org

Fellowships for Minorities

GEM Fellowship Program

Box 537
Notre Dame IN 46556

Phone: (219) 631-7771
E-mail: gem@nd.edu
Fax: (574) 287-1486
Homepage: http://www.gemfellowship.org/

Ford Predoctoral Fellowships for Minorities

Fellowship Office, GR 346A
National Research Council of the National Academies
550 Fifth Street, NW
Washington, DC 20001

Phone: (202) 334-2872
E-mail: infofell@nas.edu
Homepage: http://sites.nationalacademies.org/pga/fordfellowships/index.htm

MIT BE
BIOLOGICAL ENGINEERING

Ph.D. Project & Advisor Preference

Name: _____

I have discussed research opportunities with the following BE faculty:
(Identify at least three with whom you have discussed possible projects)

1. _____
2. _____
3. _____

My project choices for my doctoral thesis research, in order of preference, are as follows *(indicate faculty name and approximate title of project)*:

1. _____
_____

2. _____
_____

This form may be submitted to the BE Academic Office beginning **November 16th, 2017, but no later than February 1, 2018**. Every effort will be made to match students with the first choice of advisor and project. In most cases, students will be notified of the official advisor assignment within two weeks after the form is submitted.

_____ _____

Student Signature *Date*

MIT BE
BIOLOGICAL ENGINEERING

Doctoral Thesis Committee Form

The following Committee has been formed as of (Date): / /
to supervise the doctoral thesis of:

Student Name:_____

The Committee should be comprised of the thesis advisor(s) plus a minimum of two additional members, one of whom must be a member of the BE faculty. The Committee Chair (who presides at all Committee meetings, including the Oral Examination) must be a BE faculty member.

Committee Members	**Signature**
1. Advisor:	
2. Thesis Chair:	
3.	
4.	
5.	

Student's Signature:_____Date:_____

MIT BE
BIOLOGICAL ENGINEERING

Oral Examination for the Doctoral Degree

Graduate Student: _____ (Name) _____ (E-mail)

Committee Chairperson: _____ (Name) _____ (E-mail)

Advisor: _____ (Name) _____ (E-mail)

Co-advisor (if any): _____ (Name) _____ (E-mail)

Name(s) of Additional Committee Member(s): _____ (Name)

_____ (Name)

_____ (Name)

Date of Examination: _____ (MM/DD/YYYY)

Type of Examination: ☐ Thesis Proposal

☐ Thesis Defense

Examination Results: ☐ Pass

☐ Conditional Pass (Explanation Required)

☐ Fail (Explanation Required)

Chairperson *Comments:*

_____ (Signature of Committee Chairperson) _____ (Date)

Please return this form by email to: be-grad-office@mit.edu or deliver the hard-copy to the BE Academic Office in 16-267 within 2 weeks following the Committee Meeting.

MIT BE
BIOLOGICAL ENGINEERING

Thesis Progress Report

Graduate Student: _____ (Name) _____ (E-mail)

Committee Chairperson: _____ (Name) _____ (E-mail)

Advisor: _____ (Name) _____ (E-mail)

Co-advisor (if any): _____ (Name) _____ (E-mail)

Name(s) of Additional Committee Member(s): _____ (Name)

_____ (Name)

_____ (Name)

Date of Current Thesis Committee Meeting: _____ (MM/DD/YYYY)

Date of Previous Thesis Committee Meeting: _____ (MM/DD/YYYY)

Anticipated Date of Next Thesis Committee Meeting: _____ (MM/DD/YYYY)

Thesis Committee Meetings are required annually per BE policy.

The Student sections should be completed prior to the Thesis Committee Meeting.

Student *Research update — In this meeting, I seek feedback on the following aspects of my project(s):*

Chairperson *Comments:*

Please see back of form for additional topics and the signature line for the Thesis Committee Chairperson.

Student *Career goals:*
Chairperson *Comments:*
Student *Current timeline for graduation:*
Chairperson *Comments:*
Student *Other topics to discuss:*
Chairperson *Comments:*

Signature of Committee Chairperson Date

Please return this form by email to: be-grad-office@mit.edu or deliver the hard-copy to the BE Academic Office in 16-267 within 2 weeks following the Committee Meeting.

MIT BE

BIOLOGICAL ENGINEERING

REQUEST FOR APPROVAL OF DEPARTMENTAL MINOR

Student Name: _____

Title of Minor: _____

Date:

Subject Number*	Subject Title	Units	H or G Level
1.			
2.			
3.			

***If it is not apparent how the three proposed subjects represent a coherent theme for your Minor, please attach a typed written explanation.**

Student Signature: _____ **Date:** _____

Thesis Supervisor(s) Signature(s): _____ **Date:** _____

_____ **Date:** _____

PLEASE RETURN THIS FORM TO THE BE ACADEMIC OFFICE, 16-267. THE ACADEMIC OFFICE WILL SEEK APPROVAL OF THE GRADUATE PROGRAM COMMITTEE.
IF APPROVED, A COPY OF THIS FORM WILL BE MAILED TO THE STUDENT AND THE THESIS SUPERVISOR(S),INDICATING THE APPROVAL.

APPROVAL OF COMMITTEE FOR GRADUATE STUDENTS

SIGNATURE: _____ **Date:** _____